

PHYSICS 250: COMPUTATIONAL PHYSICS

Instructor: David W. Miller, PRC 245,
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Lecture Times:	Tue–Thur 2:00pm–3:20pm
Lecture Location:	KPTC 309 (Kersten Physics Teaching Center)
Textbook:	None required, many suggested! (see Reading List)
Canvas Course Site:	https://canvas.uchicago.edu/courses/16987
Piazza Site:	https://piazza.com/uchicago/spring2018/phys227
Prof. Office Hours:	Mon. 2:00pm–3:00pm, and by appt.
Computer Lab Hours:	Help is available specifically for PHYS 250 by TAs in the Computer Science Instructional Lab (CSIL), 1st floor of Crerar, on: Tue 7:00-9:00 pm in CSIL 1 Wed 2:30-4:00 pm in CSIL 2 Wed 7:00-9:00 pm in CSIL 1
Teaching Assistants:	See the <i>Additional Information</i> section.
Description:	This course introduces the use of computers in the physical sciences. After an introduction to programming basics, we will cover numerical solutions to fundamental types of problems, techniques for manipulating large data sets, neural networks, and the basics of data analysis.
Homework (70%):	<i>Canvas:</i> Problem sets and materials are available on Canvas . <i>Due Date: Fridays.</i> Graded problem sets will returned during Discussion (afterwards in envelopes near KPTC 106). <i>Collaboration Policy:</i> Collaboration on issues, concepts, and approaches is encouraged, but the work <i>must be your own</i> .
Final Project (30%):	Week of Dec. 3rd (<i>Details TBD</i>)

TENTATIVE COURSE OUTLINE:

The weekly coverage is subject to changes and adjustments as the course progresses.

Week	Week Of	Lecture Topics, Exams, Information
Week 1: Lec 1–3	Mon Mar 26	<ul style="list-style-type: none"> • Maxwell's eqns and conservation laws • Stress tensor and Poynting's vector • Relevant reading: Griffiths Ch. 7.1-8.2
Week 2: Lec 4–6	Mon Apr 2	<ul style="list-style-type: none"> • EM waves: wave eqn, plane waves in vacuum • Quiz: Wed Apr. 4, Discussion Section • Relevant reading: Griffiths Ch. 9.1, 9.2
Week 3: Lec 7–9	Mon Apr 9	<ul style="list-style-type: none"> • Polarized waves and waves in media • Reflection and transmission of waves • Relevant reading: Griffiths Ch. 9.1.4, 9.3
Week 4: Lec 10–12	Mon Apr. 16	<ul style="list-style-type: none"> • Absorption, dispersion, EM waves in conductors • Quiz: Wed Apr. 18, Discussion Section • Relevant reading: Griffiths Ch. 9.4
Week 5: Lec 13–15	Mon Apr. 23	<ul style="list-style-type: none"> • Guided waves, potential formulation of waves • Gauge transformations • Relevant reading: Griffiths Chapter 9.5, 10.1
Week 6: Lec 16–17	Mon Apr. 30	<ul style="list-style-type: none"> • Mid-Term Exam: Mon Apr 30, 9:30–10:20am • Retarded potentials • Relevant reading: Griffiths Ch. 10.2
Week 7: Lec 18–20	Mon May. 7	<ul style="list-style-type: none"> • Retarded potentials and multipole expansion • Lienard-Wiechert Potentials • Relevant reading: Griffiths Ch. 10.3
Week 8: Lec 21–23	Mon May. 14	<ul style="list-style-type: none"> • Dipole radiation, magnetic dipole radiation • Quiz: Wed May 16, Discussion Section • Relevant reading: Griffiths Ch. 11.1, 11.2
Week 9: Lec 24–25	Mon May. 21	<ul style="list-style-type: none"> • Half-wave antenna, relativistic Electrodynamics • Relevant reading: Griffiths Ch. 12.3
Week 10: Lec 26–27	Mon May 28	<ul style="list-style-type: none"> • Holiday: Memorial Day, Mon May 28 • Seniors Final Exam: Wed May. 30, 1–3pm • Reading Period: Thurs–Fri May 31– Jun. 1 • Maxwell's equations in invariant form • Relevant reading: Griffiths Ch. 12.3
Week 11	Mon Jun. 4	<ul style="list-style-type: none"> • Final Exam: Wed Jun. 6, 10:30am–12:30pm

TEXTBOOKS ON RESERVE AT CRERAR LIBRARY:

All textbooks on reserve are also listed on [Chalk](#).

Required Textbook:

- Griffiths, *Introduction to electrodynamics (4th Edition)* QC680.G74 2013

Recommended References:

- Jackson, *Classical Electrodynamics (3rd Edition)* QC631.J3 1999
- Wangsness, *Electromagnetic fields (2nd Edition)* QC665.E4W360 1979
- Panofsky & Phillips, *Classical Electricity and Magnetism* QC518.P337 2005
- Heald & Marion, *Classical Electromagnetic Radiation* QC661.H43 1995
- Konopinski, *Electromagnetic Fields and Relativistic Particles* QC665.E4K660
- Feynman, *Lectures on Physics, Vol. II.* QC23.F44
- Purcell, *Electricity and Magnetism (Berkeley Physics)* QC522.P87 1985
- Lorrain & Corson, *Electromagnetic Fields and Waves (3rd Edition)* QC665.E4L67 1988

Supplementary Math Texts (not on reserve):

- Arfken & Weber, *Mathematical Methods for Physicists* QA37.2.A740 1995
- Greenberg, *Advanced Engineering Mathematics* TA330.G725 1998
- Schey, *Div, Grad, Curl, and All That* QA433.S28 2005

ADDITIONAL INFORMATION FOR THE COURSE:

Teaching Assistants (TA):

All TA Office Hours will take place in **KPTC 307** except where otherwise noted. Discussion Sections begin on Wednesday April 4th. Discussion Sections all take place on **Wednesdays from 3:30pm–4:20pm** and Students are assigned according to their Last Name.

TA Name	Email	Office Hours	Discussion	Last Names
Wen Han Chiu	wenhan@	Tues 4:30pm	KPTC 103	A – K
Kristian Mackewicz	kmackewicz@	Thur 2:30pm	KPTC 105	L – Z

Exams:

- There will be two exams, a mid-term given during the lecture period as scheduled in the syllabus and a final exam, as scheduled by the Registrar.
- The mid-term will be given on Monday, Apr. 30 during class. The mid-term will count toward 25% of your grade.
- The final exam will be given on Wednesday, June 6 from 10:30am–12:30pm. The final exam will count toward 30% of the course grade.
- The exams will be closed book. For both exams, you will be given supplementary material with the exam. Calculators will be permitted for use during the exam. No other notes or references will be allowed.
- ***There are no make-up exams.*** If there is an important reason that you cannot take an exam, make arrangements with the Prof. David Miller at least one day in advance of the exam. If you are sick or an emergency arises which prevents you from taking the exam without prior arrangement, you must have a signed note from your doctor or undergraduate advisor explaining your absence. No exceptions will be made to this rule and you will get a 0 grade for a missed exam if these conditions are not met.

Schedule and Section Assignment Information:

- Discussion Sections will begin meeting in Week 2 of Spring Quarter. Room assignments will be posted on the bulletin boards outside KPTC 106.

Piazza

This term we will be using **Piazza** for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself.

- Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza.
- If you have any problems or feedback, email myself or the Piazza developers: team@piazza.com
- Find our class page at: <https://piazza.com/uchicago/spring2018/phys227/home>

Miscellaneous

- Students with special needs or who may need extra time on any exam or other deadlines should alert me during Week 1 or as soon as possible after enrolling in the course.